UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

Civil Action No. 04-11807 MLW

CINGULAR WIRELESS PCS, LLC,
and EASTERN TOWERS, LLC,
Plaintiffs,

v.

TOWN OF WAYLAND, MASSACHUSETTS,
BOARD OF APPEALS of the TOWN OF
WAYLAND and JAMES E. GRUMBACH, ERIC B.
GOLDBERG, STEVEN FUGARAZZO, LAWRENCE K.
GLICK, SUSAN KOFFMAN, SHAUNT SORIAN,
ADIA GENNIS, LINDA SEGAL, as they are members
and alternate members of the Board,
Defendants.

SECOND AFFIDAVIT OF TIMOTHY WYSOCKI TO ADDRESS CINGULAR'S NETWORK

I, Timothy Wysocki being duly sworn, state as follows:

1. I submit this affidavit to describe Cingular Wireless's need for a wireless communication facility at the property known as 137 Boston Post Road, Wayland Massachusetts ("Site") as shown on plans for Eastern Towers.

2. I previously signed an affidavit in this matter on February 2, 2005, describing the facts as they pertain to the network originally operated by AT&T Wireless PCS, LLC ("AT&T Wireless"). My qualifications are set forth in that affidavit.

3. I am aware that AT&T Wireless was purchased by Cingular and is now known as New Cingular Wireless PCS, LLC. The purpose of this affidavit is to address the current situation, now that the former AT&T Wireless network and the Cingular Wireless network have been united and are being joined together.

Cingular Wireless Network

4. Cingular Wireless is licensed by the Federal Communications Commission (FCC) to provide wireless phone service in areas across the country, including the Boston Metropolitan Trading Area (MTA). Wayland, Massachusetts is located within that MTA, and therefore Cingular Wireless is licensed to provide wireless phone service within Wayland and surrounding communities.

5. Wireless phone coverage is provided by placement of a number low-

power antenna sites within a given area. The sites are spaced so that the coverage from each location overlaps with its neighboring sites. When a call is placed on a certain site, the phone monitors the signal from the serving site, as well as the signal of all the adjacent sites. When the phone receives a stronger signal from the adjacent site, it requests a transfer from the site it is currently using to the stronger site. If there is seamless coverage provided by the carrier, the call will transfer without interruption. If there is a lack of appropriate signal strength at the transfer point, the call will degrade and possibly drop.

6. Wireless signals are measured in units of dBm (decibels (dB) referenced to one thousandth of a watt (a milliwatt)). Because the numbers are negative, –75 dBm is stronger or has a higher worth than -85 and -85 is greater than -95 and so on.

Need for Cingular Wireless Proposed Facility

7. On behalf of Cingular Wireless, I evaluated the need for coverage at the Site, based upon the data reported in my first affidavit, as well as information regarding the location and components of both the AT&T Wireless network and the Cingular network ("Combined Network") in the area of the proposed Site.

8. I have evaluated Cingular's need for the Site by using geographic coordinates and computer models that are generally accepted as reliable in the RF field. These computer models have been calibrated to reflect Cingular's network's actual performance. In this case, the models were run by Scott Pollister, an experienced RF specialist under my supervision. I regularly rely upon work by Mr. Pollister in my profession, including such computer-generated coverage plots. Using these tools, I determined that a coverage gap exists for the Combined Network in the area of the proposed wireless communication facility. The purpose of the installation of Cingular equipment on the proposed facility is to address this coverage gap.

9. Attached as **Exhibit 1** and **Exhibit 2** are radio frequency maps, using the procedure described in Paragraph 8 above, depicting existing Cingular coverage in and around Wayland, MA (Exhibit 1) and the additional coverage that would be provided by the Combined Network (Exhibit 2). The maps show that the Facility would address a substantial portion of the Coverage Gap and would, importantly, connect to existing coverage in the area.

10. For this application, a signal strength of -82dBm overlapping coverage is desired. This overlap is where signal coverage from two adjacent sites meet and eliminate any areas that are below the required signal strength.

11. Attached as Exhibit 3 is an explanation of how Cingular derives its -82 dBm standard for Cingular's in-building suburban coverage. In addition, my experience as an RF engineer confirms that roughly -82 dBm is an appropriate threshold for designing a network to achieve in-building coverage in a suburban environment. This threshold is comparable to the -85 dBm threshold previously used by AT&T Wireless for in-building suburban coverage, as explained to the Wayland Zoning Board of Appeals during my testimony regarding this site (and in my first affidavit). The difference of -3 dBm between the former AT&T Wireless standard and the Cingular standard reflects that some

of the calculations require choosing a value within a range of possible values. That difference does not affect the determination whether the Combined Network has a significant gap in coverage in the vicinity of the proposed Site.

12. The -82dBm level is represented on the attached coverage plots in the areas shaded in green and yellow.[1] Signal strength of the Combined Network between -82 dBm and -92 dBm is shown in pink. Signal strength below -92dBm is shown in white.

13. Exhibit 1, the first coverage plot titled "Cingular Wireless Coverage, Wayland Mass. (MA 1056) – Combined Coverage of Current Network Configuration" shows that a portion of Wayland lies in a pink shaded area representing the fringe of coverage from our existing sites in the respective original frequency bands from both Cingular and the former AT&T Wireless (850 MHz band for Cingular and 1900 MHz band for AT&T Wireless), just as exhibit E to my first affidavit showed AT&T Wireless coverage in the so-called 1900 MHz band. This pink and white shaded area has a signal strength of between -82dBm and below, which represents a higher likelihood of a degraded signal and dropped call.

14. Exhibit 2, entitled "Cingular Wireless Coverage, Wayland Mass. (MA 1056) – Combined Coverage of Future Integrated Network)", shows the coverage, and resulting gap, that the Combined Network can achieve, without the proposed site. This exhibit reflects capacity of the Combined Network, once the surrounding sites are configured to operate as a single network (using the 850 MHz frequency band), instead of the two, separate AT&T Wireless and Cingular networks. The same standard (-82dBm to -92 dBm) was used for the pink shading, as discussed in the previous paragraph, and the anticipated quality of coverage in the shaded areas still demonstrate a need for the proposed facility.

15. The attached coverage maps show that, without the proposed facility at the Site, there would be a substantial gap in the Combined Network's coverage in Wayland and the surrounding area. Indeed, the gap shown on exhibit 2 at the -82 dBm (suburban in-building coverage) level is approximately 1.3 miles. The gap at the -92dBm level is approximately ¼ miles. These are high demand areas in which Cingular Wireless would lack adequate network communications without a facility at the Site. The installation at the proposed elevation on the Site is necessary in light of this substantial coverage gap in Wayland.

16. Outside the green and yellow shaded areas, customers cannot always be certain that their phone call will go through or continue; there is a likelihood of degraded voice or sound quality on the call; and it is possible that an ongoing phone call could be lost altogether if for example the customer goes into a low lying area. In some unshaded areas, it may be impossible to place a call at all.

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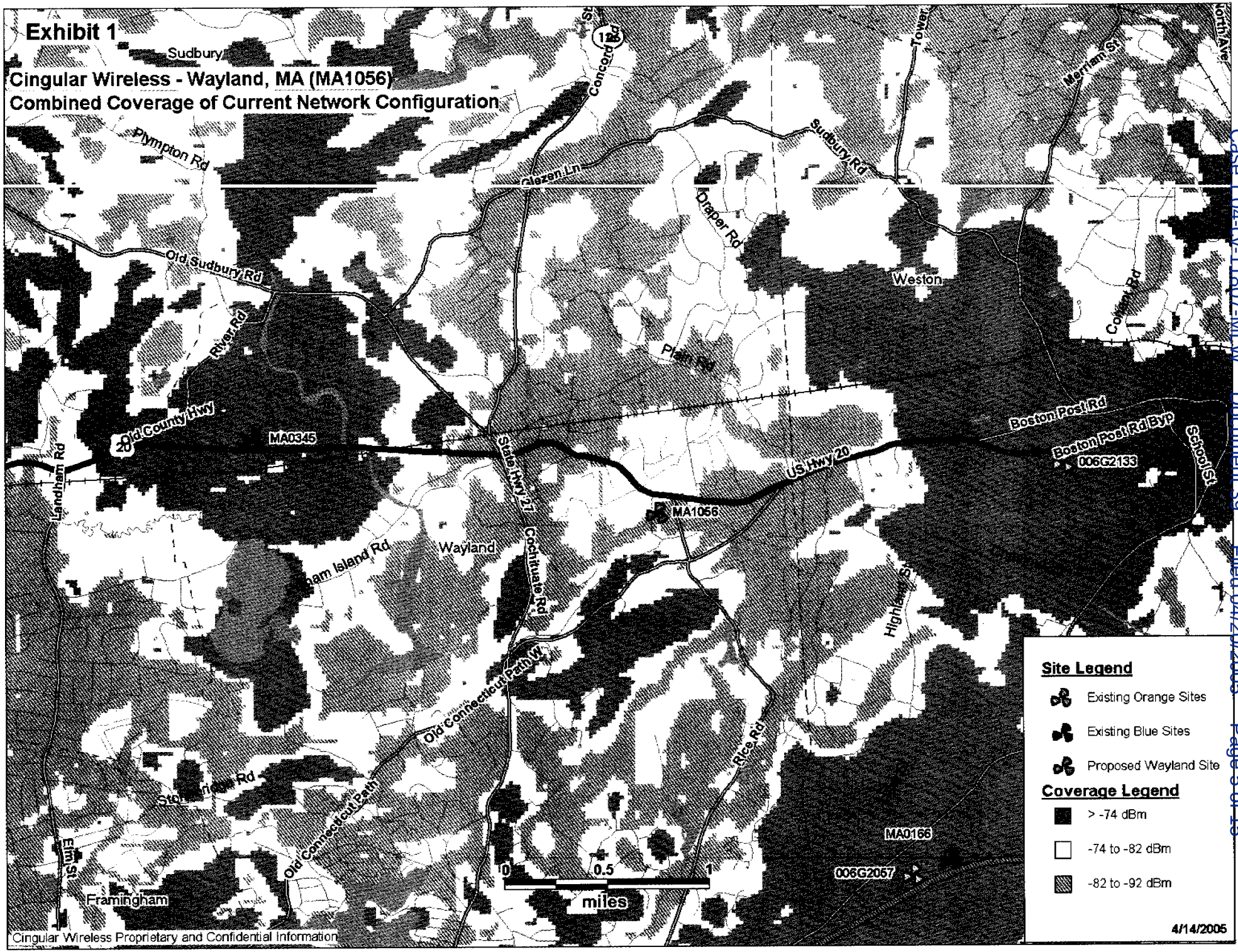
[1] The yellow area shows the location of coverage at the -74dBm or better level, which would represent an appropriate signal strength for urban, in-building coverage.

17. The proposed Cingular cellular facility will enhance the wireless telephone service to the residents and business owners of Wayland, MA in the area of the coverage gap.

Signed under penalties of perjury
This 15th Day of April, 2005,

Timothy Wysocki
Radio Frequency Performance Manager
Cingular Wireless



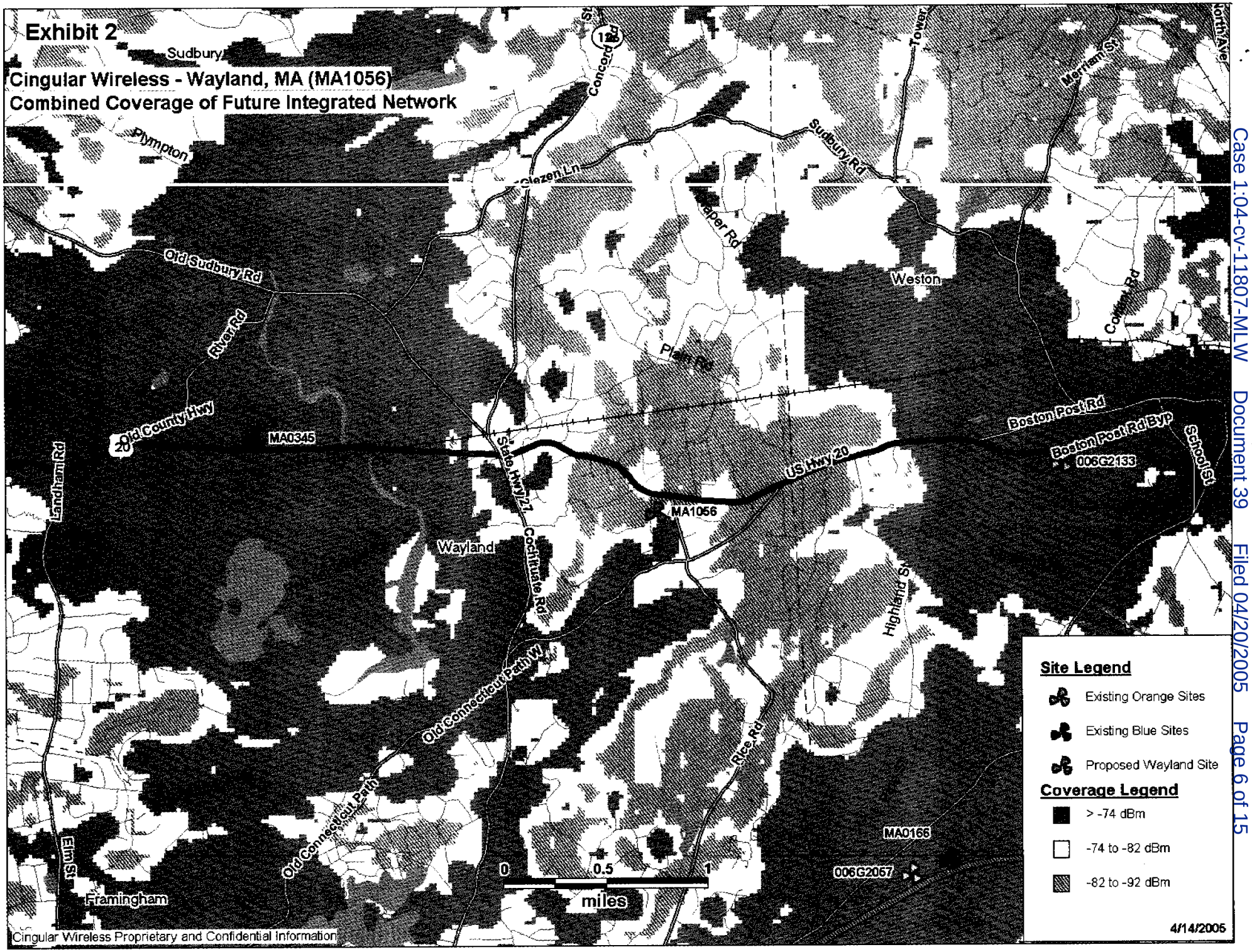


Exhibit 3

RF Engineering Supplementary Information

Re:

Proposed Wayland, MA - Wireless Facility

Prepared by:

New Cingular Wireless

April 14, 2005

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1 – The Proposed Facility

On behalf of Cingular Wireless, I have determined that a coverage gap exists in the area of the proposed Wireless Communications Facility. The purpose of installation of the proposed facility is to address this coverage gap.

Cingular Wireless proposes to install, operate and maintain a wireless communications facility including antennas, cables, a cable tray, an equipment shelter, generator and propane tank, to be installed within and next to the proposed flagpole-style monopole as shone in the associated plans. The site plans also shows Cingular Wireless' proposal to locate antennas at an antenna centerline of approximately 120 feet above ground level

The proposed antennas, cables, equipment cabinets, and generator are described in detail on the plans and specifications submitted herewith. The proposed installation will be an unoccupied, unmanned, specialized wireless telecommunications facility. The installation will be served by telephone and electric service.

The characteristics of the proposed installation are as follows:

- Number of Cingular Wireless antennas to be located on the tower: up to six (6) two (2) per sector, for three (3) sectors
- Proposed antenna centerline: 120' AGL
- Antenna type, manufacturer, model: Kathrein 800-10121 or equivalent
- Each antenna will be approximately 54.5 inches high by 5.9 inches wide by 2 inches deep
- 88 degree beamwith
- 13.6 dBi gain for 824-896 MHz and 16.4 dBi gain for 1850-1990 MHz
- Number of channels per antenna, projected are 4 with expansion to 10 (excluding future UMTS plans)
- Output frequencies of the Transmitter are Cellular a band (824-847 MHz) and PCS A band (1930 – 1945 MHz)
- Receive frequencies range between 869 to 892 MHz and 1850 to 1860 MHz
- The site will be using Synthesized Frequency Hopping
- Power input to the Antenna(s): 44.5 dBm (-cable loss –combiners)
- Typical ERP output values at the antenna range from 50 to 200 watts depending on the site and equipment configurations.

Cingular expressly reserves the right to substitute substantially similar equipment, or to add, modify and/or replace equipment in order to be in compliance with any current or future federal, state or local mandated application, including, but not limited to, emergency 911 communication services. In the event that the equipment referenced herein is unavailable for installation or otherwise replaced by Cingular, substantially similar equipment will be installed.

However, if additional permissions were needed to install the above equipment and were not forthcoming, Cingular would build the site according to the plans submitted to the Board during the zoning process.

The proposed wireless facility will enhance wireless telephone service to the residents and businesses of Wayland. Through a fully digital system, this technology affords improved reception, more private communication, increased ability to handle data, short messaging, enhanced cellular battery life, and other technological advances.

2 – Objective

Cingular Wireless is providing the following supplementary information to re-emphasize the need for the proposed 120-foot flagpole-style monopole wireless communication tower and supporting wireless communication ground equipment at 135 Boston Post Road, in Wayland, MA.

Cingular Wireless has two primary coverage objectives in Wayland, MA, one to provide "In-Building" coverage to as many of the residents and commercial business of Wayland as possible and two, to provide "In-Vehicle" coverage to residents of Wayland and other Cingular Wireless subscribers traveling through Wayland along US Highway 20 and other major roads, from the surrounding communities. "In-Building" coverage refers to a grade of service (GOS) having a level of call quality that is greater than or equal to that of landline telephone service. In order to successfully compete both with landline and other wireless service providers, Cingular Wireless is attempting to provide optimal coverage to as much of the population of Wayland as possible. "In-vehicle" service is slightly less than the requirement for "in-building" service. This is based on the assumption that the vehicle is typically in constant motion and more susceptible to the negative effects of signal "fades" and multi-path". Subscribers within the home or office however, are subject to greater signal penetration losses (solid walls, partitions, etc) that attenuate the signal and affect call quality.

2.1 – The Need for the Proposed Facility

In some of the target area, Cingular Wireless currently provides signal strength sufficient to achieve a basic level of service. However, the current signal strength is insufficient under Cingular Wireless' quality control standards to provide a suitable level of indoor and in-vehicle coverage in this area of Wayland. Therefore, to meet consumer demand for increased quality for voice and data services, including such advanced services as text messaging, electronic mail, send and receive pictures, and internet browsing, particularly in light of the change in customer usage patterns, the additional signal strength from the proposed facility is necessary.

The current level of service provided by Cingular Wireless' existing sites in this area may allow for adequate outdoor coverage. However, Cingular Wireless must be responsive to changes in the wireless industry's competitive environment and to changes in subscribers' (and potential subscribers') usage patterns. Subscribers are moving away from wireless communications as a supplement to wireline communications, and are increasingly using wireless communications as their primary mode of communication for voice and data transmissions.[1] As such, subscribers are frequently using their mobile devices inside their homes and offices.[2]

This increasing use of mobile devices indoors presents new challenges for network design. The signal strength that is appropriate to service a particular outdoor area is insufficient to penetrate the layers of walls and office infrastructure where subscribers are now using their wireless devices. As a result, the insufficient signal strength required to provide appropriate indoor and in-vehicle coverage constitutes a significant gap in Cingular Wireless' coverage in this area. To retain its existing subscribers (and

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1 *See* Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, WT Docket No. 02-379 (Released July 14, 2003), p. 49 (hereinafter the "FCC Report")("Once solely a business tool, wireless phones are now a mass-market consumer device… There is much evidence, however, that consumers are substituting wireless service for traditional wireline communications."). (internal citations omitted).

2 "One analyst estimates that wireless has now displaced about 30 percent of total wireline minutes". *Id.* at 50. (internal citations omitted).

attract new subscribers) Cingular Wireless must meet subscriber expectations, and must increase its coverage strength to provide competitive, high-quality voice and data services in these areas.

As subscribers usage patterns shift to substitute wireless for traditional wireline communications, placing the two services in direct competition,[3] wireless carriers must continue to provide nearly the same level of quality to which those subscribers have become accustomed from traditional wireline communications. In addition, as all carriers work to increase the array of services offered in areas in which they already provide some level of coverage, the determining factor of customer satisfaction will increasingly move away from whether the provider has the capability to provide some service for voice transmission, but instead the level of quality of the network for both voice[4] and data transmission[5] will become the benchmark.[6]

Concerning data transmission, the competition with wireline providers is not limited to traditional dial-up services using "plain old telephone service" ("POTS") lines, but also includes without limitation broadband providers such as Digital Subscriber Lines ("DSL"),[7] T-1 lines, cable modems, and Integrated Services Digital Network ("ISDN"). These enhanced wireline services represent a fast-growing segment of the communications industry and provide much greater transfer speeds than the traditional POTS lines, and it is these providers with whom wireless carriers, including Cingular Wireless, must keep pace.

Subscribers use the data transfer rate to evaluate quality between different providers, and enhanced signal strength is the key to providing competitive transfer rates. The reason for the enhanced signal strength is similar to the need faced by providers of Asymmetric Digital Subscriber Line ("ADSL") services that the subscriber be located within a certain distance of a "hub" – the closer the subscriber is to the hub the greater the transfer rate, and the further away from the hub the slower the transfer rate. However, for wireless carriers the distance requirement is replaced by signal strength, *i.e.* the greater the signal strength, the greater the potential data transfer rate.

As discussed above, enhanced signal strength is the key to competing with both wireline and wireless communications carriers for both voice and data services. It is this competition between and among the wireless carriers and wireline carriers, that creates benefits for the consumer i.e. the residents and

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[3] *Id.*

[4] The evaluation of voice call quality includes, without limitation, the ability to connect the call on the first attempt, the ability to carry the call to completion, and the ability of the participants to have their voices transmitted clearly.

[5] The evaluation of data transmission includes, without limitation, the ability to connect to the service on the first attempt, the ability to complete the transfer of data, and the speed at which the data transfer occurs ("data transfer rate"). Subscribers equate quality with the data transfer rate. If the signal strength is weak or of poor quality the data transfer rate may suffer.

[6] The FCC Report provides that "[c]onsistent with findings in previous reports, customers indicated cost and network quality as the main reason for changing provider." FCC Report at 35. (internal citations omitted). The FCC Report also states that "[a]nalysts have noted that a negative impression of a carrier's service quality can be detrimental to its market share," and that "[e]vidence from the CMRS [commercial mobile radio services] marketplace shows that carriers compete in terms of service quality." *Id.* at 69, 41-42.

[7] DSL has a number of variants, but the most common type is known as Asymmetric Digital Subscriber Line ("ADSL").

businesses of Wayland. Through competition, the consumers realize greater benefits and greater choice of providers for these services thus leading to enhanced services, improved quality, and lower prices. The effect of competition is further embodied by the FCC's regulations which make clear that the purpose of the construction requirements is to "foster rapid development of a competitive market that will provide consumers with access to a diverse array of high-quality, low-costs PCS services and products on a wide-area basis" (¶ 158). *See* 47 C.F.R.§ 24.203.[8]

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[8] The FCC's Final Rule is designed to:

- "facilitate implementation of a broad range of new wireless services" (¶ Summary);
- "foster rapid creation of a competitive market to deliver these new mobile digital voice and data services to the American public" (¶ 3);
- "better achieve what had been and continue to be [the FCC's] four primary goals in this proceeding: competitive delivery, a diverse array of services, rapid deployment and wider area coverage" (¶ 4);
- further congressional objectives including "promoting economic growth and competition, enhancing widespread access to telecommunication service offerings and ensuring the PCS licenses are disseminated to a wide variety of applicants" (¶ 4);
- "enable PCS providers to compete effectively with each other and with other wireless providers so that the American public can enjoy the greatest benefit from the delivery of these new services" (¶ 5);
- ensure "that firms will compete not only on price, but also on quality and the types of new products and services they offer" (¶ 6);
- promote "rapid deployment [which] is important so that consumers do not have to wait for the benefits of the new services" (¶ 7);
- "ensure that PCS service is made available to as many communities as possible and that the spectrum is used effectively" (¶ 107);
- "increase the viability and value of some Broadband licenses, especially those in less densely populated service areas" (¶ 108);
- "ensure efficient spectrum utilization and promote significant Nationwide coverage without imposing substantial cost penalties on licensees that serve less densely populated areas" (¶ 109);
- "foster provision of PCS services and ... promote diversity in their provision" (¶ 111);
- "improve PCS licensee's ability to configure their systems to best serve the needs of their customers and to compete with other mobile services such as Cellular in wide area SMR" (¶ 117);
- "promote the goal of service to less populated areas" (¶ 118);
- "ensure balanced base-to-mobile and mobile-to-base communications" (¶ 119);
- "ensure that the American public benefits from the new mobile digital voice and data services" (¶ 158); and
- "foster rapid development of a competitive market that will provide consumers with access to a diverse array of high quality, low cost PCS services and products" (¶ 158).

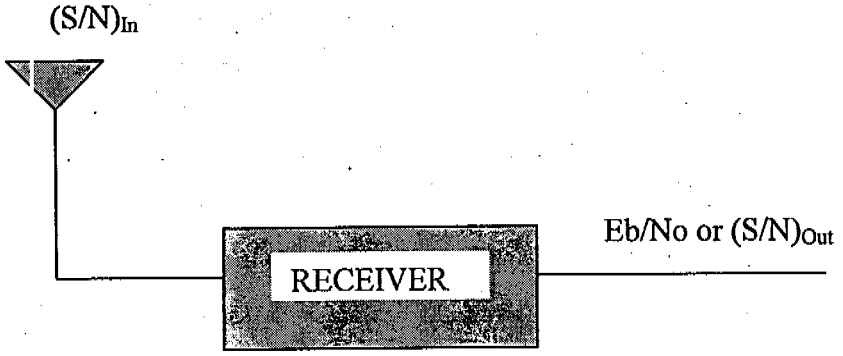
2.2 – Receiver Sensitivity and Minimum Thresholds

Receive sensitivity of a mobile or base station receiver can be defined as the measure of the mobile's ability to receive weak signals. The next few paragraphs will develop a link budget calculation to determine the minimum required signal needed to provide a reliable connection to a handheld mobile. While determining the optimum signal level a number of factors need to be taken into consideration. These include:

1. Receiver Thermal Noise
2. Signal to Noise Ratio
3. Fade Margin
4. Penetration Losses

2.2.1 – Receiver Thermal Noise

Thermal Noise in receivers is generated even in the absence of signals. It includes noise generated by antenna resistance as well as noise generated in the front-end of the receiver.



Antenna noise that is transferred is given by ***10log(Ktb)***

Where k= Boltzman's Constant($1.38X10^{-23}$ J/K)

T=System Temperature (290K)

B=System noise Bandwidth (200kHz in our case)

Substituting these values in the equation antenna noise comes out to be –120.9dB.

In a perfect antenna system this would be the only source of noise. However the receiver contributes additional noise determined by the noise figure (NF) of the equipment. According to Dr. William C.Y. Lee's "Mobile Cellular Communication" a nominal figure of 9dB can be used for the Noise figure. The total Receiver Thermal Noise can then be calculated as

$$N=10\log(KTB) + NF = -120.9dBm + 9dB = -111.9dBm$$

The value above quantifies a detection threshold and not a useable signal.

2.2.2 – Signal to Noise Ratio

Once an overall system noise floor has been developed (as above), the next step is to determine the minimum level that a signal must be above that noise floor in order to allow for coherent signal decoding. This is commonly referred to as a S/N (Signal to Noise) or C/N (Carrier to Noise) ratio. This ratio is usually developed by the equipment manufacturers, in a lab scenario, by using multiple

listeners and subjective quality assessments. These lab tests are commonly referred to as "MOS" tests – for Mean Opinion Scoring. Within these tests, listeners are played tapes of sentences and asked to rate the quality of the audio. The tapes will simulate speech with higher and lower rates of digital errors in the transmission. Once an acceptable quality of speech is established, that is correlated by the testing to a certain maximum acceptable Bit Error Rate (BER) for a certain method of speech coding. Based on the specific modulation scheme, this BER can be equated to S/N. For GSM (the national standard that defines the technology used by Cingular), this C/I (or S/N) ratio has been determined by the radio equipment vendors to be a required minimum of 9dB for acceptable quality.

2.2.3 – Fade Margin

Fading is a common occurrence in a mobile radio environment. There are two types of fading: a long term fade (lognormal) and a short term fade (Rayleigh). The terrain contour and other fixed obstacles such as buildings between the base station and the mobile causes long-term fades. The received signals are log-normally distributed around the mean signal level. The mean signal strength can thus be modeled as a log-normally distributed curve with standard deviation σ. The probability that the mean signal will exceed a given threshold level x is given by a probability distribution function.

$$P(x) = (1/(\sigma * 2*\Pi)^{0.5}) \exp(-(x-xmean)^2)/2*\sigma^2)$$

Using this equation we can arrive at the signal threshold that is necessary to ensure that an appropriate percentage of locations at the cell boundary will have signal strength equal to or greater than the minimum acceptable service threshold. For a suburban environment, using a standard deviation of 8dB, propagation law constant of 3.5 and 90% reliability, we come up with a 10.5dB fade margin. The required minimum signal can now be calculated as:

$$Rxmin = N = 10\log(KTB) + NF + S/N + Fade\ Margin = -120.9 + 9 + 9 + 10.5 = -92.4dBm \sim -93dBm$$

2.2.4 – Penetration Losses

The coverage threshold can finally be determined based on the receiving environment of the mobile. RF signals suffer penetration losses when a call is made from different environments. Each environment has varying penetration losses that are generalized to arrive at the final desired design threshold. The typical losses associated with each environment type are as follows:

- In Vehicle Penetration Loss = Vary between 6-10 dB = ***8dB average***
- In Building Penetration Loss (Rural and Suburban) = Vary between 8 – 14 dB = ***11 dB average***
- In Building Penetration Loss (Urban and Dense Urban) Vary between 16 – 22 dB = ***19 dB average***

Adding this number to the calculated minimum signal required for a reliable mobile connection, the final design threshold for each environment is as follows:

- In Vehicle design threshold = -93 dBm + 8 dB = ***-85 dBm***
- Rural / Suburban In Building design threshold = -93 dBm + 11 dB = ***-82 dBm***
- Urban / Dense Urban In-Building design threshold = -93 + 19 dB = ***-74 dBm***

2.3 – Critical Coverage Areas and Objectives

As previously mentioned, Cingular Wireless has two primary coverage objectives in Wayland, MA; (1) "In-Vehicle" and (2) "In-Building". One of the major considerations for measuring the importance of coverage gaps for Cingular Wireless is population and traffic data. According to the US Census taken in year 2000, the total population for the Town of Wayland is 13,100 (11,905 Urban / 1,195 Rural) and a population density of approximately 856.77 people per square mile. Moreover, the Town of Wayland and the surrounding areas along Route 20 and 27 are high-demand areas, carrying approximately 23,100 cars on Route 20 and 22,400 cars on Route 27 per day.[9] Cingular Wireless will continue to lack adequate communications network service without the proposed facility at this site. The population of the Town of Wayland in combination with the importance of Route 20 and 27, and the surrounding secondary routes that act as important conduits between subscribers' homes and offices make the increased strength for in-vehicle and indoor coverage provided by the site necessary to increase the reliability of voice and data transmissions in this area.

3 – Summary

The terrain and topography of Wayland limit the coverage from existing sites and also limit the number of locations that might work to fill the coverage gaps in Wayland. No existing structures are available to provide the needed coverage. The location and height of the planned site was chosen to achieve an optimal balance between meeting coverage objectives, reducing the number of antenna sites required in Wayland and minimizing impact on the neighborhood. Without a site in this area a significant gap in service will exist.

Timothy Wysocki
Radio Frequency Performance Manager
Cingular Wireless

4/14/05
Date

[9] According to the 1999 Traffic Volumes Report prepared by the Massachusetts Highway Department, Route 20 east of Rte 27 has average traffic volumes of 23,100 cars per day. While Route 27 north of Pelham Island Rd. has average traffic volumes of 22,400.